Access controlled optical disc and method therefor

The present invention relates to a method of controlling access to an optical disc, in particular when read by an optical disc data reader such as, for example, a CD-ROM drive in a personal computer. The invention also relates to an optical disc to which access is controlled.

All digital audio compact discs (CD-DAs) are manufactured to an International Standard (IEC International Standard 908), which is more commonly known to those skilled in the art as the Philips™ and Sony™ "Red Book" standard. This sets strict parameters on such features as the physical dimensions of the disc, the EFM data encoding scheme and the Reed-Solomon error correction which is employed. Compact disc read-only memories (CD-ROMs), by contrast, are encoded to a different standard (ISO/IEC International Standard 10149), which is more commonly known to those skilled in the art as the "Yellow Book" standard. The Yellow Book standard incorporates but extends the Red Book standard such that, as a rule, a CD-ROM drive in a computer can make the data on the CD-ROM available to a computer system (for manipulation, execution or copying), but can also read the audio signal data on a CD-DA.

Digital copying, by producing essentially perfect copies of the original, has resulted in many millions of illegal copies of CDs or other digital information carriers being made. This, in turn, has led to a significant loss in copyright royalties. A substantial proportion of this unauthorized activity is associated with home copying and so considerable effort in recent years has been directed to developing various methods to prevent copying of audio compact discs onto readily

available low cost digital media.

In general these developments can be characterized as aiming to produce either a processed complete disc or a disc with selected processed tracks, which have thereby been rendered difficult to copy successfully on certain types of data reader. These attempts at digital audio copy protection have usually focused on the prevention of copying, or even playing, on a personal computer (PC). Most of the prior art techniques utilize differences in the manner in which optical disc data readers and CD audio devices access and playback the data on an optical disc.

WO-A-99/57723 discloses a method that involves interrupting the laser beam used to record a CD or glass master disc, the duration, frequency and placement of the laser beam interruptions being dependent on the content of the data being recorded.

WO-A-00/74053 discloses a method whereby selected control data on a CD is rendered incorrect, such incorrect data not being generally accessed or read by an audio player but being such as to render the CD unplayable by a data reader.

WO-A-01/61695 discloses a method whereby the timing and/or navigation data in the P- and Q-subchannels of a CD is rendered incorrect or inaccurate, thus interfering with the extraction or reading of the audio data by a data reader.

US-B-6208598 discloses a method whereby selected sequences of audio data samples are substituted by incorrect data and the corresponding part of the P-channel is altered to prevent the incorrect data samples being passed to the digital-to-analogue converter of an audio player, an interpolated value being used instead. A copy disc however will not

generally have the modified P-channel and so the incorrect data will be replayed, causing audible distortion.

WO-A-01/15028 and WO-A-01/41130 disclose a method whereby selected audio signal data symbols are overwritten with grossly-erroneous values, the error correction parity symbols associated with the said data symbols are then located and overwritten in such a way as to create uncorrectable errors in the codewords containing the erroneous values, such that a CD player will apply interpolative error-concealment to prevent the output of the error.

The above systems of necessity all suffer from limitations, either by limiting the strength (and thereby the effectiveness) of the applied copy protection process in order to attempt to ensure 100% compatibility on all types of audio player, or by deliberately limiting its compatibility to certain types of replay device. Such limitation in use is likely to be commercially unattractive.

It is an object of the present invention to provide a method of content access control, particularly but not exclusively for controlling access to audio material recorded on optical discs. It is a further object of the present invention to provide an optical disc whose data is access controlled.

According to a first aspect of the present invention, there is provided an optical disc comprising at least one primary track, at least one alternate track, and disc access information stored upon the disc and which is read and utilized only by an optical disc data reader, the disc access information being such as to allow location only of

the alternate track(s) when the disc is read by the said optical disc data reader.

The approach taken by the present invention relies upon the different way in which different types of replay device locate tracks upon the disc. By optical disc data reader is meant any device which allows random reading of data upon the disc, such as a CD-ROM drive or the like. Such devices are normally a part of a personal computer. Optical disc data readers are to be contrasted with CD-DA players such as are found in hi-fi or stereo players, which use a more sequential approach to the reading of digital audio data and which cannot read, for example, compressed audio data.

Preferably, there are a plurality of primary tracks and a plurality of alternate tracks, at least one of the primary tracks having an associated alternate track. Either one, several, or all of the main/primary tracks on the disc may be provided with associated alternate/secondary tracks.

For example, consider an optical disc with 10 tracks, 7 of which are primary tracks and 3 of which are alternate tracks. Consider also that the three alternate tracks each have a corresponding primary track. In that case, the three alternate tracks may include data which, when replayed, is substantially identical to that of the three corresponding primary tracks. However, importantly, whilst a CD-DA player may access the primary tracks (and, preferably, only the primary tracks), an optical disc data reader is able instead to access the four primary tracks which have no alternate track counterpart, and the 3 alternate tracks.

In general terms, where an optical disc has m primary tracks and n alternate tracks, (m+n in total),

the disc access information preferably indicates to an optical disc data reader that there are only m tracks in total on the disc, made up of n alternate tracks and (m-n) primary tracks. Of course, in that case the disc access information preferably indicates to a CD-DA player that there are likewise only m tracks, though here these are the m primary tracks.

The benefit of this becomes most apparent when, for example, those primary tracks which would, with prior art optical discs, be the most likely to be pirated are recorded with corresponding alternate tracks. Then, the primary tracks (which will be accessed by a CD-DA player) can be played normally on a CD-DA player. When the disc is accessed by an optical disc data reader, however, it is able to locate only 4 of the 7 primary tracks (which may be of less concern to the copyright holder in those tracks, for example), and the three alternate tracks.

The alternate tracks may in preferred embodiments comprise standard uncompressed digital audio (CD-DA) format data. Whilst the optical disc data reader may be able to play back the three alternate tracks (in this example) as well (so that the output of an audio player on a personal computer is substantially the same for all 7 accessible tracks as the output of the 7 primary tracks when played back via a CD-DA player), in that case the alternate tracks can be copy protected or otherwise altered to prevent copying through data extraction and, optionally, by the subsequent use of a CD writer in communication with the optical disc data reader.

In one embodiment, the alternate tracks may be copy protected using known techniques. Thus, the above exemplary disc access control arrangement potentially provides for playback of all 7 primary tracks without

any issues of compatibility with CD-DA players, but may allow copy protection of some (or, indeed, all) of the same tracks when played by an optical disc data reader by the use of the alternate tracks. Nevertheless, it is to be understood that the alternate tracks do not necessarily have to encode the same audio information as their corresponding primary tracks. Depending on the application, the associated alternate tracks may either be shorter, the same length or longer than the corresponding primary track. For example, rather than copy protecting the alternate tracks, a primary track representing a piece of music may be associated with a short excerpt from that piece of music which forms the associated alternate track. Then, a CD-DA will play all of the piece of music (but without the risk of it being digitally copied at least onto another optical disc), whereas only the excerpt will be played back when (to a user) the apparent same track is accessed by an optical disc data reader.

As an additional or alternative feature, depending on the application, the alternate tracks may carry a short message, such as: "This disc is access controlled". Such a message may be included either by itself, or following a few seconds of the same content as contained on the primary track, or superimposed over a few seconds of the same content as contained on the corresponding primary track. Such a message may be repeated, if this is felt necessary to convey the relevant information.

As a further additional or alternative feature, the associated alternate tracks may comprise a monophonic version of the same content as contained on the corresponding primary track on one channel (left or right) and a spoken message as described above on the other channel (right or left). Such alternate

tracks would thereby reproduce the required spoken message when replayed on an optical disc data reader and also be copied in this same form onto any copy made of the content but nonetheless permit replay of the monophonic version of the content (without the message) by suitable adjustment of the left/right balance control provided in any disc replay software associated with the optical disc data reader. Alternatively, the associated alternate tracks may comprise the same content as contained on the corresponding primary track but with the spoken message added in opposite phase on the two channels (left and right), whereby any stereo reproduction would include the message but a monophonic reproduction would not include the message.

As yet a further alternative or additional feature, the associated alternate tracks may comprise the same content as contained on the corresponding primary track but with a degraded quality, such that the content is still suitable for listening to in a workplace, for example, but is unsuitable for listening to in a more critical environment such as on high fidelity audio equipment. Such degradation may comprise, for example, the introduction of compression artefacts and/or the addition of low level random noise. Optionally, such noise or other interference could be added in opposite phase on the two channels, whereby any stereo reproduction or copying of the track would include the added noise but a monophonic reproduction of the track content would not include the noise or interference.

Still a further alternative or additional feature may include the use of compressed audio files in the alternate tracks. For example, the audio files of the alternate tracks may be compressed using MPEG 2/level

3 (MP3), Ogg Vorbis™, streaming audio (e.g. Real Audio™ or Windows ™ Media), or some other form of audio data compression scheme generally accessible by data readers.

Such compressed tracks may incorporate a digital rights management technique allowing access by a data reader subject to certain conditions pre-set by the rights owner at the time of creation of the disc. Such conditions, for example, may allow the tracks to play on only a limited number of occasions, or for a limited number of days after first being accessed by that particular data reader, or they may allow the tracks to be uploaded to the data reader's hard disk but then bind the track to that particular data reader to prevent usable copies of that track being distributed.

When the alternate tracks include standard CD-DA format audio data (rather than compressed audio), and in particular when the alternate tracks are shorter than the primary tracks, it may be desirable to include additional compressed audio data which can be recorded to the disc in a second session using known techniques. The use of additional compressed audio files, recorded in a second session, when combined with the foregoing and following methods, provides a significant improvement over the known technique of combining copy protected CD audio tracks with compressed audio files.

The above-mentioned advantages of the invention result at least partly from a method for identifying and editing track data in the Table of Contents (TOC) of the disc. An embodiment of the invention therefore allows editing the information in the Point field of the TOC entries both for the primary and for the secondary tracks and also in certain other TOC data

fields which relate to the disc as a whole.

In preference, the disc access information is included within a table of contents (TOC) of the optical disc, the TOC having a track number indicator indicative of the track number for each of the tracks on the disc, the track number indicator for the or each primary track which has an associated alternate track preferably being set to zero.

In a further alternative, the entry or entries in the TOC for the or each primary track are swapped with the respective entry or entries for the or each of the corresponding alternate tracks.

In still a further preferred feature of the present invention, the disc access information is modified so that starting time of at least one of the primary tracks for which there is a corresponding alternate track is changed to the starting time of that alternate track. Entries in the disc access information relating to the primary tracks may optionally be deleted. The advantage of this procedure is that the data related to the relevant primary track(s) is removed from the disc access information (e.g. the TOC) and thus cannot be readily regenerated by someone intent on gaining access to such primary tracks on a data reader.

The track number indicator for the or each alternate track which has a corresponding primary track is preferably set to indicate the track number of the corresponding primary track.

In each case, it is preferable that the number of tracks on the disc, as indicated to a CD-DA player, is equal to the number of primary tracks only. A CD-DA player will then ignore any alternate tracks.

In a preferred embodiment, the optical disc may include substitute disc access information stored

within one or more of the alternate tracks in encrypted form, the substitute disc access information, when decrypted, being readable by an optical disc data reader and further being utilized thereby, when so decrypted, to permit location of the primary track(s). In that case, it is preferable that the optical disc also includes a further track, which in turn includes software code that, when executed by a computer that controls the optical disc data reader, causes the substitute disc access information to be decrypted. The software code may, for example, be executed automatically upon inserting the disc into the computer. Provided that a correct password or the like is entered by a user upon prompting by the computer, the substitute disc access information may then be decrypted and used instead of the "default" disc access information stored upon the disc and which would otherwise be used to control disc access. For example, the substitute disc access information may allow access to the, some more, or all of the primary tracks. The manner of decryption does not form a part of the present invention. However it will be understood that the password, for example, used to initiate the decryption by the software code on the disc may be subject to purchase by a user so that, in effect, a user pays for unlimited access to (including a licence to copy, perhaps) the primary track(s). If the user does not enter a valid password when prompted, it will be understood that the user need not be prevented from accessing the disc at all, but the original (default) disc access information would then continue to be used so that the user has restricted or no access to the primary tracks.

It is to be understood that the substitute disc access information need not necessarily be included as

one of the alternate tracks but may instead be written to the disc in a second session (using known techniques), as described above.

According to a second aspect of the present invention, there is provided a method of generating data for writing onto an optical disc, the method comprising generating primary data representative of m primary track(s) for the optical disc ($m \geq 1$), generating alternate data representative of n alternate track(s)for the optical disc ($n \geq 1$), and assembling a table of contents (TOC) for the optical disc, the TOC containing disc access control information which, when written to an optical disc, indicates to an optical disc data reader that there are m tracks in total written upon that optical disc. In preference, the disc access control information also indicates to a CD-DA player that there are only m tracks on the disc. Preferably, the m tracks indicated to be present to a CD-DA player are different from the m tracks indicated to be present to an optical disc data reader. For example, an optical disc data reader may determine from the disc access control information that there are n alternate tracks and (m-n) primary tracks, whereas a CD-DA player may simply determine the presence of the m primary tracks.

The invention also extends to an optical disc master upon which is written or stamped data in accordance with the foregoing techniques. This optical disc master may in turn be used to produce, either directly or indirectly, one or more optical discs.

In an alternative aspect, the invention extends to an optical disc onto which data is burned, the data having been generated in accordance with the foregoing techniques.

According to still a further aspect of the

present invention, there is provided a method of controlling access by an optical disc data reader to an optical disc having at least one primary track and at least one alternate track, the method comprising the step of preventing the location of the, or at least one of the, primary track(s) when the disc is read by the said optical disc data reader.

The invention may be put into practice in a number of ways, and some of these will now be described by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a process flow diagram showing a sequence of operations to produce an edited TOC and an access-controlled disc according to an embodiment of the invention;

Figure 2 shows a Table of Contents (TOC) for an original unmodified disc;

Figure 3 shows an edited Table of Contents (TOC) for an access-controlled disc according to a first embodiment of the invention;

Figure 4 shows an edited Table of Contents (TOC) for an access-controlled disc according to a second embodiment of the invention; and

Figure 5 shows an edited Table of Contents (TOC) for an access-controlled disc according to a third embodiment of the invention.

It will be understood by those skilled in the art that part of the data stream on a CD-DA (audio CD) is set aside to carry several sub-code channels, labeled P,W,R,S,T,U,V and W. Only the P and Q subchannels contain control data for the disc. The Q subchannel can operate in four modes, of which only three (Modes 1, 2 and 3) carry active data. When the Q subchannel is operating in Mode 1, it carries data for the disc

lead-in zone, the program zone and the disc lead out zone.

The Q subchannel data content in the lead-in zone differs from the data elsewhere on the disc. In mode 1, the lead-in data comprises the Table of Contents (TOC) for the disc. The TOC stores data indicating, inter alia, the number of audio tracks and the starting times of each track.

Referring now to Figure 1, a process flow diagram of a sequence of operations to produce an edited (TOC) is shown.

Each of an array of first tracks for a CD, referred to hereinafter as "primary" tracks are first assembled at step 101 on a PC's hard disk. Next, a further set of tracks, referred to hereinafter as "alternate" tracks" are assembled in the corresponding order (step 102) on the PC's hard disc. A CD-R disc is then burned at step 103, using readily available CD-R burning software which will be well known to those skilled in the art and does not form a part of the present invention. It should be noted at this point that it is important that the tracks are assembled by the CD-R burning software in such a way that all the primary tracks (including any that may not have corresponding secondary tracks) are recorded on the disc first, in the required program order. This complete sequence of primary tracks is then followed by the secondary tracks in the relevant sequence. At step 104, the CD-R is then read back into the PC and at step 105, the TOC is analysed. The TOC is then edited at step 106 and this edited TOC is then used to produce a master disc image at step 107.

This sequence of actions is taken in order that the initial TOC data may be created by the chosen disc burning software to match precisely the way in which

it assembles the tracks on the disc and this data is then edited. However, it should be noted that it is equally possible to generate an edited TOC directly, provided the precise duration of every track, the disc lead-in, the inter-track pauses and the disc lead-out is known.

Figure 2 illustrates the unedited TOC data for a sample disc containing four audio tracks of approximately 30 seconds duration each. When the Point field is set to 0xa0 as in Entry 0, the minute field Pmin of that Entry 0, 201, shows the number of the first track on the disc. When the Point field is set to 0xa1 as in Entry 1, the minute field Pmin of Entry 1, 202, shows the number of the last track on the disc. Entries 3, 4, 5 and 6 contain the data relating to each program track and in this example the Point field 203 of each entry (in the form 0xnn, where nn is the relevant track number in hexadecimal format) indicates the track number. It should be noted that the numbered Entries (0, 1, 2, 3 4, etc.) in square brackets [ ] are merely headings for convenience of reference, which are treated by the CD burning software as comments which are not to be acted upon.

Figure 3 illustrates the edited TOC data resulting from the application, to a sample disc, of a first method in accordance with the present invention. In the embodiment of Figure 2, the sample disc contains four tracks, comprising two primary tracks of approximately 30 seconds duration each, and two tracks nominated as alternate tracks, also of approximately 30 seconds duration each. First, the number of tracks on the disc, as noted at 301 in the minute field Pmin of Entry 1, is modified to correspond with the number of primary tracks only (i.e. 2 in this case). Secondly, the data in the Point

field 302 for each primary track for which there is a corresponding alternate track is then changed to read 0 (zero), and finally the data in the Point field of each corresponding alternate track is then edited so as to have the track number of the relevant primary track, so in this example the Point field 303 for track 3 (Entry 5) is changed to 0x01 and the Point field 304 for track 4 (Entry 6) is changed to 0x02.

A TOC edited as described in connection with Figure 3 may be written back to an optical disc as described above in connection with Figure 1. An optical disc including such an edited TOC will be access controlled as follows.

A CD-DA attempting to access a disc with a TOC edited in accordance with Figure 3 will be told that there are only two tracks on the disc. This is because CD-DA players use the information in the Pmin field 301 of Entry 1 to determine the number of tracks m on the disc. The first m tracks are then read. Any tracks after the mth track are then ignored by a CD-DA player. Thus, by setting the Entry 1 Pmin pointer to 2, in this example, a CD-DA will ignore the 2 "extra" alternate tracks after the primary tracks.

By contrast, when an optical disc data recorder accesses a disc with a TOC thus modified, it uses the information in the Pmin field 201 of Entry 0 to determine the number of the first track on the disc, and then searches for that number in the Point fields of the information in the PTime fields of the numbered track entries to determine the location on the disc of the relevant tracks, as well as using the information in the Pmin field 301 of Entry 1. Thus, an optical disc data reader is always directed to the two alternate tracks and is not aware of the presence of the two primary tracks.

The method described in connection with Figure 3 is generally applicable, not just in the case (as described) where there are equal numbers of primary and alternate tracks. In certain circumstances, it may be desirable to include fewer alternate tracks than primary tracks, for example when there are a number of tracks the copying of which would not be of significant concern to a copyright holder. For example, there may be 10 tracks in total on a disc, 7 of which are primary tracks and three of which are alternate tracks. Then, three of the primary tracks may have corresponding alternate tracks, so that 4 of the primary tracks have no corresponding alternate track. Then, a CD-DA will locate the 7 primary tracks and an optical disc data reader will locate 4 of the 7 primary tracks and the three alternate tracks.

It will therefore be understood that, even though there are a total of m primary + n alternate tracks on such a disc, different devices (CD-DA player and CD-ROM drive, for example) will both access, in preferred embodiments, the same number of tracks (the m primary tracks in the case of the CD-DA player, and the (m-n) + n (=m) primary and alternate tracks in the case of the optical disc data reader).

Whilst the technique described above does require that there are more tracks in total (m+n) than are ever used by a single device (CD-DA player or CD-ROM drive), the effective reduction in disc capacity is not considered to be a significant handicap, particularly given the benefits of the invention. Indeed, most audio CDs do not use anywhere near their maximum storage capacity (equivalent to about 70 to 80 minutes of audio data in CD-DA format). Thus, even where all of the primary tracks have alternate tracks that are in CD-DA format (perhaps with some form of

copy protection) and where each of those alternate tracks are of equal or substantially equal length to their corresponding primary tracks, disc space is not usually a problem. In many cases, the alternate tracks may in fact be substantially shorter than the primary tracks (containing, perhaps, CD-DA audio representing an excerpt of the corresponding primary track, or a spoken copy protection warning as described above). Moreover, the alternate tracks, which are always accessed exclusively by an optical disc data reader rather than a CD-DA player in the described embodiments, can employ known audio compression techniques such as Moving Pictures Experts Group (MPEG) 2/level 3 (MP3), Ogg Vorbis™, streaming audio (e.g. Real Audio™ or Windows ™ Media), or some other form of audio data compression scheme generally accessible by data readers, to reduce the size of the alternate tracks.

When the alternate tracks include standard CD-DA format audio data (rather than compressed audio), it may be desirable to include additional compressed audio data which can be recorded to the disc in a second session using known techniques. The use of additional compressed audio files, recorded in a second session, when combined with the foregoing and following methods, provides a significant improvement over the known technique of combining copy protected CD audio tracks with compressed audio files. A CD-DA player will, of necessity, have to read a processed copy protected track when attempting to play back the latter type of disc. This in turn may well result in playback artefacts as will be the case with some of the prior art arrangements set out above. A CD-DA player playing a disc formed in accordance with embodiments of the present invention will, by

contrast, not have to play a processed (primary) track so that no possibility of playback artefacts exists. When an optical disc data reader plays back a disc in accordance with the present invention, however, it is directed to the alternate tracks, optionally along with the additional compressed audio files recorded in the second session. A voice message on the alternate tracks can direct the data reader user to play the compressed files if they wish to listen to the disc content. If desired, a software player for the compressed files can be bundled with the compressed files on the disc, and this software player can be set to autoplay when the disc is inserted in the data reader. If a copy of such a disc were made, the only content which would appear on the copied disc would be the alternate tracks and (subject to the characteristics and settings of the copying software utilised) any data content, such as the alternative compressed files along with the software player where present.

Figure 4 illustrates the edited TOC data resulting from the application to the same unedited sample disc (Figure 2) of a second method which embodies the present invention. First, the number of TOC entries is reduced by the number of secondary tracks on the disc - in this example with 2 secondary tracks, the number of entries (indicated in Figure 4 at 401) is reduced from 7 to 5. Secondly, the number of tracks on the disc, as noted in the minute field Pmin 402 of Entry 1, is modified to correspond with the number of primary tracks only (i.e. 2). Thirdly, the entries for each primary track for which there is a corresponding alternate track are completely deleted (in this case Entries 3 and 4), and finally the data in the Point field of each corresponding alternate

track is then edited so as to have the track number of the relevant primary track, so in this example the Point field 403 for track 3 (Entry 5) is changed to 0x01 and the Point field 404 for track 4 (Entry 6) is changed to 0x02. This second method has the advantage that the data related to the relevant primary tracks has been removed from the TOC and thus cannot be readily regenerated by someone intent on gaining access to such primary tracks on a data reader.

Referring now to Figure 5, a third method according to an embodiment of the present invention is illustrated. First, the number of tracks on the disc, as noted in the minute field Pmin, 501, of Entry 1, is modified so as to correspond with the number of primary tracks only, in this case 2. Secondly, the data in the PTime field for each primary track for which there is a corresponding alternate track is changed so as to have the relevant starting time of that corresponding alternate track, so in this example the Pmin, Psec and Pframes fields 502 for track 1 (Entry 3) are changed to 1, 2 and 71 respectively, whilst the Pmin, Psec and Pframes fields 503 for track 2 (Entry 4) are changed to 1, 33 and 32. Having done this, it is not necessary to delete the Entries 5 and 6, although this may be done if desired. Of course, if these two entries are removed, then it is necessary in consequence to amend the total number of TOC entries as is done with the second method described above in connection with Figure 4. As with that second method, this third method has the advantage that the data related to the relevant primary tracks has been removed from the TOC and thus cannot be readily regenerated by someone intent on gaining access to such primary tracks on a data reader.

In a fifth method embodying the present invention, the complete TOC entries for the alternate tracks are swapped with those of the primary tracks and the track numbers exchanged so that the alternate tracks have the track numbers of the primary tracks and vice versa. The number of tracks on the disc, as noted in the minute field Pmin of Entry 1, is again modified to correspond with the number of primary tracks only.

The methods described in the foregoing may be optionally enhanced by encrypting the alternate tracks and/or requiring a password to be entered to gain access to them. In a further embodiment, one of the alternate tracks could be an encrypted version of a different, substitute TOC, accessible only to users who are given access to the decryption key - possibly in return for paying a fee. Access to such a substitute TOC would then enable a data reader to access some, some more or all of the primary tracks. In that case, a small additional data track recorded on the disc is usually necessary, to decode and extract the encrypted substitute TOC, such that the optical disc data reader can then use that (substitute) TOC instead. Rather than including the substitute TOC as one of the alternate tracks, it will be understood that the substitute TOC may instead be written to the disc in a second session, using known techniques, as described above in connection with the addition of further compressed audio files. Optionally, any executable code to allow access to this substitute TOC may be included as a data file recorded in a second session as well.

Additional electronic security features and enhancements, known to those skilled in the art, may

also be incorporated into the system for greater assurance.

It will be understood that the methods described do not of necessity require copy protection or digital rights management techniques to be applied to the alternate tracks: the methods embodying the invention can be operated in 'stand-alone' mode (that is, simply as a disc access control procedure) or incorporated as an extension to existing types of digital audio copy protection. By altering the number, length and nature of the alternate tracks, a wide variety of different applications is envisaged, some of which will be more appropriate to closed user groups and some of which are more applicable for use with the general public. There is independence in terms of what type of copy protection methods may be utilized, what additional security features may be incorporated and what means of CD burning software may be used.

While the preferred embodiments of the invention have been described herein, it is to be understood that the invention is not limited to these and modifications of the embodiments described may become apparent to those of ordinary skill in the art.